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ABSTRACTS OF PAPERS

FOURTH ANNUAL ROCKY MOUNTAIN
SPECTROSCOPY CONFERENCE

Park Lane Hotel
Denver, Colorado

August 10-11, 1961

Sponsored by The Rocky Mountain Section
of the Society for Applied Spectroscopy

Typed Courtesy of The Ohio Oil Company, Littleton, Colorado

Thursday Morning, August 10

9:15 - C. W. Gullikson and W. S. Ferguson, Ohio Oil Company,
Littleton, Colorado,

Fluorescence in Crude Oils.

Using a Cary Model 14 spectrophotometer, with fluorescence attachment, studies were made to determine the relationship "between chart divisions (absorbance) and relative intensity of fluorescence emission.

The fluorescence spectra of 12 selected crude oils were obtained and compared in terms of relative intensity and wavelength.

Three of the above crudes were selected for further study. Each was subjected to a modified USBM distillation, and each distillation cut was further separated by silica gel chromatography. Each of the latter was again separated by alumina chromatography, and a few of the alumina fractions were further resolved by a second alumina chromatographic procedure. All of the above fractions were studied on the basis of their fluorescence spectra, and attempts were made to interpret the spectra in terms of composition.

9:45 - Brenton H. Madison, Sundstrand Turbo, Denver, Colorado.

The Use of Infrared and Ultraviolet Spectroscopy in the
Testing and Evaluation of High Temperature Synthetic
Lubricants.

The use of infrared and ultraviolet spectroscopy to solve various analytical problems concerned with the usage of high temperature synthetic lubricants is presented. The data and spectra given were obtained largely from test work with *100°F bulk oil lubricants for the auxiliary power

system of the XB-70 supersonic bomber. The use of differential IR analysis at high scale expansion is demonstrated for the detection of thermal decomposition products, and this technique is also compared with *UV* analysis for estimation of additive levels and additive degradation.

Some additional work is also presented on certain metal transfer phenomena observed in synthetic lubricants at high temperatures, as well as the detection by spectroscopic means of various contaminants.

10:30 - L. D. Frederickson, Jr., Spectran Laboratories, Inc.,
Denver, Colorado.

Infrared Absorption Spectra Characteristic of the Vanadium-Oxygen Linkage.

A study has been made of infrared spectral absorptions characteristic of the vanadium-oxygen bond link as they occur in ortho, meta and pyro vanadates, polyvanadates, vanadium salts of organic acids, and miscellaneous other vanadyl compounds. The usefulness of correlation of such spectra with structure has been examined in terms of the spectra of vanadium minerals and ores. Vanadium, in its higher valence states, forms covalent linkages with oxygen, and this, plus the relatively light atomic weight for the element, provides some interesting spectral patterns in the rock-salt region of the infrared spectrum. The spectra are discussed in terms of qualitative analysis for particular salts, and also with regard to crystal habit or arrangements, with the aim of providing information as to the structure of such compounds which are not included in this study.

11:00 - Frederick Brech, Jarrell-Ash Co., Newtonville, Massachusetts.
Developments in Atomic-Absorption Spectroscopy.

No abstract available.

11:30 - Fred Walter, Ball Brothers Research Corp., Boulder, Colorado.
Some Recent Developments in the Vacuum Ultraviolet.

A brief summary will be given on the gains made in advanced instrumentation for vacuum UV lab work and color spectroscopy. Results of new measurements will be discussed, and difficulties and progress of spectroscopic research in the wavelength region below 1000 Å will be covered in some detail. Special attention will be given to material properties, e. g, transmittance, photoemission, irradiation of painted surfaces, and associated problems in this region of the spectrum.

Thursday Afternoon, August 10

1:30 - Wilbur Kaye, Beckman Instruments, Inc., Fullerton, California.

Analytical Applications of Far Ultraviolet Spectroscopy.

The spectral region from 1600 to 2000 Å has recently been made available to analytically inclined spectroscopists through the development of easily used, high performance instrumentation. Almost all materials absorb intensely in this region. Many compounds in the vapor phase possess characteristic spectra that have obvious uses for their identification and quantitative estimation. In particular, the gases emerging from a gas chromatograph column are susceptible to study by far ultraviolet spectroscopy. These gases can be analyzed accurately and rapidly without consuming the sample. Elaborate sample handling facilities are unnecessary. Sensitivity is comparable with the best thermal conductivity detectors and in favorable circumstances can outperform the ionization detectors.

2:00 - Glenn L. Cook, Laramie Petroleum Research Center, U. S. Bureau of Mines, Laramie, Wyoming.

Some Organic Reactions Induced by an Electron Beam.

Many of the molecular ions, initially formed in a mass spectrometer, contain energy in excess of that needed to produce the ions. This excess energy causes bond cleavage and rearrangement giving ions of lower mass than the molecular ion'. Reactions and apparent intermediate ion forms are proposed from a study of the mass spectra of about 300 sulfur compounds. The mechanisms are used to relate ion abundances and mass-to-charge ratios to the molecular structures of the compounds.

2:30 - W. E. Bush and L. J. Biggins, Lucius Pitkin, Inc., Grand Junction, Colorado.

Spectrographs Analysis for Calcium in Uranium Mill Products.

A spectrographs method has been developed for the rapid determination of calcium in uranium mill products for a concentration range from a .10% to 1.50% calcium. The dilution technique and internal standard principal are used throughout and all percent transmission readings are converted to Log I values. The method is routine for the determination of calcium in the products from twenty-six uranium mills. Comparisons with the classical oxalate method are shown.

3:15 - Open Panel Discussion on Infrared Spectroscopy.

Chairman: R. A. Nyquist, Dow Chemical Co., Midland, Michigan—Polymers and Plastics

G. L. Cook, U. S. Bureau of Mines, Laramie, Wyoming—Oil Shale and Petrochemicals

L. D. Frederickson, Jr., Spectran Laboratories, Denver, Colorado—Practical IR Analysis of the Unusual Sample

C. W. Gullikson, Ohio Oil Company, Littleton, Colorado—Raman vs. IR Analysis

W. I. Kaye, Beckman Instruments, Fullerton, California—UV and Near IR Regions in Analysis

Friday Morning, August 11

9:00 - W. L. Talbert, Ohio Oil Company, Littleton, Colorado.

Some Geochemical Applications of Mass Spectrometry.

A short review of isotopic analysis by mass spectrometry will be presented, followed by possible applications. Some light elements, such as H, C, N, O, and S, will be shown to have interesting isotopic abundances when regarded from a geochemical point of view. Current interpretations of isotopic abundance data will be presented.

9:30 - G. V. Wheeler, W. A. Ryder and K. R. Arnold, Phillips Petroleum Co., Idaho Falls, Idaho.

Analysis of Air Samples for Beryllium by the Rotating Platform Spectrographs Technique.

Beryllium is determined on air sample filter papers down to one millimicrogram by direct sparking of the filter paper mounted on a silver disk, rotated on a rotating platform electrode apparatus eccentric from the silver counter electrode. Details of the procedure, calibration techniques and precision are discussed.

10:30 - H. T. Dryer, Applied Research Laboratories, Inc., Detroit, Michigan.

Atmosphere Discharges and Their Applications with the Quantovac.

The use of gaseous atmospheres in conjunction with interrupted discharge excitation has provided many new and interesting phenomena. These have been studied and evaluated for their application to spectrochemical analysis using the ARL Quantovac.

The results of these studies will be presented, and an evaluation made of the application of "atmosphere" discharges to a variety of analytical programs, and a comparison made of the properties of argon and air systems.

11:00 - Joseph Haffty and A. W. Helz, U. S. Geological Survey, Washington, D. C

Direct-Reading Spectrometric Technique for Determining Major Constituents in Natural Water.

A spectrochemical method is indicated for the simultaneous determination of the major constituents in natural water by means of direct excitation of the water samples. By employing the rotating disk method and a photoelectric spectrometer to measure the radiant energy of the spectral lines of interest, concentrations can be established in a matter of minutes.

SYMPOSIUM ON SEMI-QUANTITATIVE METHODS OF ANALYSIS.

Friday Afternoon, August 11

1:00 - E. K. Jaycox, Bell Telephone Laboratories, Murray Hill,
New Jersey,

Semi-Quantitative Spectrochemical Analysis.

2:00 - Merlyn L. Salmon, Fluo-X-Spec laboratory, Denver, Colorado,
Routine Semi-Quantitative Fluorescent X-Ray Spectrographs
Analyses.

Flexibility and simplicity are two characteristics of fluorescent X-ray spectrography that make the method especially useful for semi-quantitative analyses of a wide variety of sample types.

In many instances the sample can be directly examined in the form that it is submitted to the laboratory and since the analytical process does not consume or destroy the sample, it is possible to return the sample to the sender or to forward the sample for examination by other analytical processes. This nondestructive feature is important in many problems. Alteration of the sample form may be necessary to improve the analytical results, however, the nondestructive process yields the sample in the analyzed form for filing or future study.

Sample types that would be impractical if not impossible to analyze by other methods are amenable by simple semi-quantitative fluorescent X-ray spectrographic techniques. Examples to be discussed are; simple and complex mineral mixtures; metals and metal alloys; solutions; surface stains on solids; inclusions in solids; multiple layers of coatings on solids; elements diffused from the base metal into the alloy cladding;

ion exchange resins; processed materials and residues; and other materials to be analyzed with the objective of "Maximum Information with Minimum Effort".

3:15 - R. G. Havens and A. T. Myers, U. S. Geological Survey,
Denver, Colorado.

Spectrochemical Analysis of Rocks and Minerals for Trace
Elements by Semi-Quantitative Methods.

4:15 - A. L. Schalge, Ohio Oil Company, Littleton, Colorado, and
H. V. Malmstadt, University of Illinois, Urbana, Illinois.

A Semi-Quantitative Procedure by the Spark-in-Spray Technique.

A semi-quantitative procedure will be described which uses solutions rather than the usual powdered samples. The spark-in-spray technique described by Schalge and Malmstadt and a high precision source unit were used to obtain the spectrum of solutions. The spark-in-spray technique will be reviewed and the general procedure of the method will be described in detail. The application of the technique to the analysis of brass, steel and silicate rock samples will be discussed.